TAMARACK CREEK BRIDGE
Yosemite National Park Roads and Bridges
Spanning Tamarack Creek on New Big Oak Flat Road
Yosemite National Park
Mariposa County
California

HAER NO. CA-84

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
P.O. Box 37127
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HAER No. CA-84

I. INTRODUCTION

Location:	Spanning Tamarack Creek on the New Big Oak Flat Road in Yosemite National Park, Mariposa County, California. UTM: 11/261875/4178840 QUAD: El Capitan, CA
Date of Construction:	1938-39
Designer and Builder:	Designer: San Francisco regional office, Public Roads Administration. Contractor: John Rocca.
Original and Present Owner	Yosemite National Park, National Park Service.
Present Use:	Park highway bridge.
Significance:	Tamarack Creek Bridge and nearby spans over Cascade and Wildcat creeks mark a departure from the "Rustic Style" bridges completed over the previous two decades elsewhere in Yosemite. The reinforced concrete open spandrel arch bridges carry the New Big Oak Flat Road over the three creeks as they tumble in steep cascades, and takes full advantage of the scenic potential. The graceful bridges are unobtrusive and harmonize with the surrounding landscape; their stream-lined look also reflects modern bridge design, as structures were planned for higher-speed travel.
Project Information:	This document was prepared as part of the 1991 Historic American Engineering Record Yosemite Roads and Bridges Recording Project, conducted by the Historic American Engineering Record in summer 1991. Richard H. Quin, Historian, 1991

II. HISTORY

This is one in a series of reports prepared for the Yosemite National Park Roads and Bridges Recording Project. HAER No. CA-117, YOSEMITE NATIONAL PARK ROADS AND BRIDGES, contains an overview history of the park roads. In addition, HAER No. CA-147, BIG OAK FLAT ROAD, contains more specific information on the specific road on which the structure is located.

Tamarack Creek Bridge

Unlike earlier "rustic-style" bridges erected in Yosemite Valley and on other park roads, the three major bridges on the New Big Oak Flat Road are striking open spandrel arch structures of exposed reinforced concrete. The graceful single-span bridges with short approaches cross Cascade, Wildcat and Tamarack creeks on the long grade between the Merced River and Meyer Pass. The three streams cascade in a series of falls to the side of and beneath the bridges. Adjacent sections of road afford motorists splendid views of the lower Yosemite Valley and the Merced River canyon, and widened shoulders and a turnout (designed along with the bridges) are provided for those who linger.

The three bridges were designed by the regional office of the Public Roads Administration* (PRA) and show the influence of other western road projects being constructed in the same period, especially the new Highway One along the Pacific coast.[1] The bridges were evidently adapted from a PRA stock plan, "Type Code 951," as reference is made to it in the final construction report.[2]

A. W. Schimberg, PRA Associate Construction Engineer, was resident engineer for the project. The location surveys for the three bridges were made from 1936 to 1938. Schimberg was assisted in this phase by two junior highway engineers, one levelman, one assistant engineering aid and a second, part-time assistant engineering aid. Their work was greatly facilitated by the adjacent road section crews' placing of stakes locating and referencing bridge and footing center lines. The survey team worked out of a field office located a mile west of the project at the west portal of Tunnel No. 3. The complicated features of the project necessitated lengthy computation work, and the survey was not completed until 1938. Plans for the three structures were prepared in the San Francisco office in 1937 and 1938.[3] The plans were reviewed by the National Park Service landscape architecture division to insure that the

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* The Public Roads Administration was the Depression-era successor to the Bureau of Public Roads of the U.S. Department of Agriculture. Since 1925, the Bureau of Public Roads had been responsible for major road projects in the national parks. In the late 1930s, the Public Roads Administration was a branch of the Federal Works Agency. After World War II, the Bureau of Public Roads was reconstituted under the U.S. Department of Commerce; today, it is housed within the U.S. Department of Transportation, Federal Highway Administration.

structures would harmonize with their settings. By the end of June 1938, a temporary log bridge was constructed over Tamarack Creek by park day labor forces.[4]

The Public Roads Administration estimated the cost for construction of the three spans at $146,616.00. The bids were opened in San Francisco on 25 August 1938, and the contract was awarded to John Rocca of San Rafael, California, who submitted the low bid of $148,099. The contract was prepared on 1 September and formally executed by the Secretary of the Interior on 16 September. Contract time began ten days later; 280 calendar days were allocated for completion. The contractor employed an average work force of 43 men on the project.[5]

Contractor Rocca performed all the work with his own forces, except for two subcontracts consented to by the PRA District Engineer. McDonald and Fealy, local operators, were engaged for the production of the concrete aggregates. The Soule Steel Company of San Francisco furnished the reinforcing steel. As Rocca had also been awarded the contract for the lining and guniting of the adjacent tunnel, he was able to house his crews in his existing construction camp at the west portal of Tunnel No. 3 [HAER No. CA-88].[6]

The Yosemite Valley Rail Road, which provided service from Merced to El Portal, charged high rates for freight, and the contractor avoided using the railway whenever possible. Only lumber for the forms and the celotex membrane was shipped by rail. Other materials were hauled in trucks over the All-Year Highway, then sent up the Coulterville Road and connecting roads to State Route 3, from which they were shipped back on Route 3 to the project location. Heavy loads had to be broken down into lighter shipments at the base of the steep grade on the Coulterville Road.[7]

Structural excavation began in late September. The drills were powered by a gasoline-driven 360 c.f.m. Gardner-Denver air compressor. Wet excavations were de-watered by two portable 3" Jaeger centrifugal pumps. Laborers working only with hand tools shoveled the excavated materials into skips for removal or onto piles adjacent to the footings; these piles were later removed by skips and truck-cranes working from the completed bridge decks.[8]

In December 1938, the workers began placing concrete for the footings. The late start was necessitated by a delay in starting aggregate production. By the end of January, all of the bridge footings were complete. While this work was underway, the contractor built a wooden platform on a parking area 1 1/4 miles west of the project. The arches for the three bridges were laid out full-size on the platforms, and patterns for the arch ribs and falsework were made. Severe winter weather caused a shutdown of operations during February and March 1939.[9]

Form work for the Tamarack Creek Bridge was not constructed until midsummer. A power band-saw was used to make the required curved and angular cuts. A high-line was rigged at the bridge site and was used to hoist the falsework and prefabricated form panels into place. Next, a celotex form lining was installed. The resident engineer noted that this was a "tedious, costly and time consuming operation."[10]

The concrete was reinforced by deformed steel bars in the floor slab, floor beams and arch ribs. These bars were supported on metal chairs. A variety of bars, ranging from 3/8" to 1 1/4" in diameter, were used in the construction of each bridge.

Calaveras brand Portland cement, delivered from the plant in San Andreas, was used exclusively. The concrete aggregates were crushed from diorite and granite stockpiled at the crusher plant at Pohono Bridge for the grading and tunnel operations. Sand was taken from a bar in the Merced River at Cascade Flat. The concrete for the Tamarack Creek Bridge was mixed in a three-bag Jaeger mixer sited at the east end of the Cascade Creek span. Concrete for the bridge had to be transported to the site in truck-mounted hoppers. The concrete was then raised by high-line to a reserve hopper, from which it was carried to the forms in carts and wheelbarrows. Mechanical vibrators were used to aid the consolidation of fresh concrete in the forms.[11]

The concrete was poured in eleven stages. First, the concrete footings were poured, followed by the main vertical pylons. The main arch rings were then poured in three stages: crown, haunches and keys. Next, the individual arch rib columns and pylons were poured in their positions above the main arch and to either side. The floor beams, slab and fascia walls were poured in the next stage, followed by the sidewalk brackets and outside walk beam. The sidewalk slab was poured next, followed by the rail riser curb. The railing was the last section poured.[12]

The three bridges were completed on October 21 1939.[13] This reflected a time overrun of forty-one days, for which the contractor was assessed damages of $2,050. The PRA Resident Engineer suggested that the delays were caused by waiting for the production of concrete aggregates, the contractor's poor choice of a superintendent for the superstructure form work at the Cascade Creek Bridge, by the complexities involved in the use of the celotex form lining,** and by the delay in removing much excavated material until final cleanup. The engineer noted that no work other than the preparation of footings was done at the Tamarack Creek Bridge until two months prior to the expiration of contract time. Cost records indicate that contractor Rocca suffered a $614 loss on the bridge contract. The total expenditure on the project was $162,823.69.[14]

The Tamarack and Wildcat creek bridges are slightly curved to accommodate their specific sites. Each span was designed for a dead load of 150 pounds per cubic foot, and was rated for a live load of two 15-ton trucks plus an

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** Engineer Schimberg recommended that the added cost and excessive care required in handling of the celotex material did not justify its use. (Schimberg, 9.)

allowance for impact. Sidewalks were rated for 100 pounds per cubic foot. The allowable compression for the concrete was 750 per square inch,and 950 pounds for arch ribs under combined loading. Class "A" concrete*** was used for the arch abutments, arch ribs, pylons, columns, fascia walls and retaining walls. Class "B" concrete was used for the column footings, and Class [D" concrete for the floor slab, floor beams, spandrel arches and rail. Expansion joints were located between each of the sectional bays; these were provided with copper seals, steel guard angles, and joint filler compound.

The curved construction of the Tamarack Creek Bridge was a design element in which the road segment and bridge were integrated into the creek's steep valleys. The curvature makes for a smooth transition from road to span, and adds a bit of continuity to the motion. The stream-lined design allowed the "high-gear" highway to sweep gracefully through the spectacular terrain. The bridges were also superelevated or banked; not only did this make the curves easier to negotiate, but it also afforded motorists magnificent views of the gorge below.

The construction of the three graceful bridges marked a departure from the "Rustic Style" structures recently employed elsewhere in the park. The poured concrete is entirely exposed (as opposed to the stone veneers and log facings used on the "Rustic Style" bridges), and except for the lithe curves of the main and supporting arches, there is no attempt at structural decoration; even chamfered corners were dispensed with other than for arch rib corners and the handrails. The Tamarack Creek Bridge remains in good condition, though some efflorescence was noted.

<u>Description</u>
Tamarack Creek Bridge is located only a tenth of a mile or so west of the Cascade Creek Bridge. Its namesake Tamarack Creek joins Cascade Creek at a cascade immediately below the first bridge. As noted above, the work on this bridge met with considerable delays, and the span was the last of the three to be completed.

The 189' (0.036 mile) long, 26' wide bridge is built on a +5.40 percent grade. The main arch is 91' wide, and rises 22' 9" from the spring line; the main pylons are located 100' apart. The roadway has a 26' clear width, and 4' sidewalks are provided on either side.

The Public Roads Administration designers estimated that the following materials would be required for construction:

Class "A" Concrete	530 cu. yds.
Class "B" Concrete	25 cu. yds.
Class "D" Concrete	456 cu. yds.
Reinforcing Steel	142,000 lbs.

*** Classes of concrete refer to the amount of Portland cement used in the mixture, with Class "A" having the highest proportion and so on.

Excavation [Removed] . . . . 950 cu. yds.

III. ENDNOTES

1. Robert Charles Pavlik, "In Harmony with the Landscape: A History of the Built Environment of Yosemite National Park, 1915-1940" (Master's thesis, University of California at Santa Barbara, 1986), 131.

2. A.W. Schimberg, Resident Engineer, Public Roads Administration, "Final Construction Report, Big Oak Flat Road, Yosemite Project 3-A1, Bridges, Yosemite National Park, Mariposa County, California," 21 January 1941, 1. Copy in Yosemite Research Library/Records Center.

3. *Ibid.*, 10-11.

4. Merriam, Superintendent's Monthly Report, May 1938, 6; John B. Wosky, Acting Superintendent's Monthly Report, December 1938, 5.

5. Schimberg, 8, 11.

6. *Ibid.*, 2-3.

7. *Ibid.*, 3-4.

8. *Ibid.*

9. *Ibid.*, 4-5.

10. *Ibid.*, 5-6.

11. *Ibid.*, 6-7, 9.

12. See the pouring schedule on U.S. Department of Agriculture, Bureau of Public Roads, "Cascade Creek Bridge, Big Oak Flat Road, Yosemite National Park Project 3A-1," Construction drawing R.G. 670-B, sheet 2, May 1938; Idem, "Tamarack Creek Bridge, Big Oak Flat Road, Yosemite National Park Project 3A-1," Construction drawing R.G. 671-B, sheet 2, May 1938; Idem, "Wildcat Creek Bridge, Big Oak Flat Road, Yosemite National Park Project 3A-1," Construction drawing R.G. 672-B, sheet 2, May 1938.

13. Pavlik, 131.

14. Schimberg, 1, 7, 10-11.

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